**LAB EXERCISE: Constructing a Periodic Table**

**(adapted from Chemactivity #3, General Chemistry Syllabus)**

Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Introduction:**

A thorough understanding of how the Periodic Table is arranged and how it allows us to make predictions is an important concept in chemistry. This lab requires the student to experience arranging a fictitious periodic table and predicting properties of a missing element.

**Procedures and Observations:**

You are part of a team of scientists aboard a spaceship that has landed on a planet in another solar system. You have available the following equipment:

* A test kit with chemicals C1, C2, C3, C4
* An instrument to measure the atomic mass of a solid
* An instrument to measure the melting temperature of a solid
* An instrument to measure the density of a material

After analyzing samples from the planet, your team concludes that all the substances are made from only 12 different elements. You are able to purify 11 of these elements, all different from those found on earth! Using your testing materials, each element is assigned a name and symbol. The mass, melting point, density and reactivity with C1, C2, C3, and C4 is determined. The elements are burned to see if they produce an oxide. The results of the tests are shown on the cards on the following page.

Your task is to organize the elements into a "Periodic Table" and complete the following tasks:

1. Cut out the squares. On each card, code the physical properties with a "P" and the chemical properties with a "C". Group the elements with similar chemical properties together.

2. Arrange the elements in the blank chart and paste into position:

a. elements must be in order of increasing atomic mass

b. elements in a column must have the same chemical properties

c. leave an empty space where appropriate ***(and later fill in the missing information)***

3. Graph the density values for the elements, leaving a gap for the missing element. Based on the graph, predict the density of the missing element. ***This lab only, draw straight lines between the points! This lab only, do not draw smooth curves!***

4. Graph the melting points for the elements, leaving a gap for the missing element. Based on the graph, predict the melting point of the missing element. ***This lab only, draw straight lines between the points! This lab only, do not draw smooth curves!***

5. Graph atomic masses of the elements to predict the atomic mass of the missing element. Explain your rationale (type!). ***This lab only, draw straight lines between the points! This lab only, do not draw smooth curves!***

1. Predict the color of the missing element. **Explain. (type!).**
2. What does periodic mean? Explain how the density values show a periodic trend and confirm your arrangement of the ‘Zodiac’ periodic table (type!).

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| Aquarius - Aq  Atomic Mass: 9.4 u  Density: 3.1 g/cm3  Yellow solid  Melting point: 260°C  Oxide: Aq2O3  Reacts with C3 to form a yellow-red solution | Aries - Ai  Atomic Mass: 11.8 u  Density: 4.0 g/cm3  Black solid  Melting point: 290°C  Oxide: doesn't form oxide  No reaction with C1, C2, C3, or C4 | Cancer - Cn  Atomic Mass: 32.3 u  Density: 6.1 g/cm3  Silver solid  Melting point: 400°C  Oxide: doesn't form oxide  No reaction with C1, C2, C3, or C4 |
| Capricorn - Cp  Atomic Mass: 3.1 u  Density: 2.5 g/cm3  White solid  Melting point: 100°C  Oxide: Cp2O  Reacts with C1 and C2 to form a white precipitate | Gemini - Gm  Atomic Mass: 16.5 u  Density: 3.5 g/cm3  Turquoise solid  Melting point: 250°C  Oxide: GmO  Reacts with C2 and C4 to produce a colored solution | Leo -Le  Atomic Mass: 29.1 u  Density: 5.0 g/cm3  Red solid  Melting point: 380°C  Oxide: Le2O3  Reacts with C3 to form a yellow-red solution |
| Libra - Lb  Atomic Mass: 27.2 u  Density: 4.5 g/cm3  Green solid  Melting point: 320°C  Oxide: LbO  Reacts with C2 and C4 to produce a colored solution | Pisces - Pi  Atomic Mass: 6.2 u  Density: 2.8 g/cm3  Blue solid  Melting point: 200°C  Oxide: PiO  Reacts with C2 and C4 to produce a colored solution | Sagittarius - Sa  Atomic Mass: 25.1 u  Density: 4.1 g/cm3  Silver solid  Melting point: 250°C  Oxide: Sa2O  Reacts with C1 and C2 to form a white precipitate |
| Scorpio - So  Atomic Mass: 14.1 u  Density: 3.0 g/cm3  Gray solid  Melting point: 180°C  Oxide: So2O  Reacts with C1 and C2 to form a white precipitate | Taurus - Tu  Atomic Mass: 20.9 u  Density: 5.0 g/cm3  Gray solid  Melting point: 330°C  Oxide: doesn't form oxide  No reaction with C1, C2, C3, or C4 | Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  Atomic Mass: \_\_\_\_\_\_  Density: \_\_\_\_\_\_\_\_\_  Color: \_\_\_\_\_\_\_\_\_\_\_  Melting point: \_\_\_\_\_\_\_  Oxide: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  Reacts with: \_\_\_\_\_\_\_\_\_\_\_\_ |

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